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Sanford

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(54) **EXPANDABLE ARROW BROADHEAD WITH CUTTING BLADE LOCKING NOTCH**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 445 days.

This patent is subject to a terminal disclaimer.

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(22) Filed: **Nov. 14, 2006**

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/410,771, filed on Apr. 24, 2006, now Pat. No. 7,226,375.

(51) **Int. Cl.**
F42B 6/08 (2006.01)

(52) **U.S. Cl.** **473/583**

(58) **Field of Classification Search** 473/578, 473/583, 584

See application file for complete search history.

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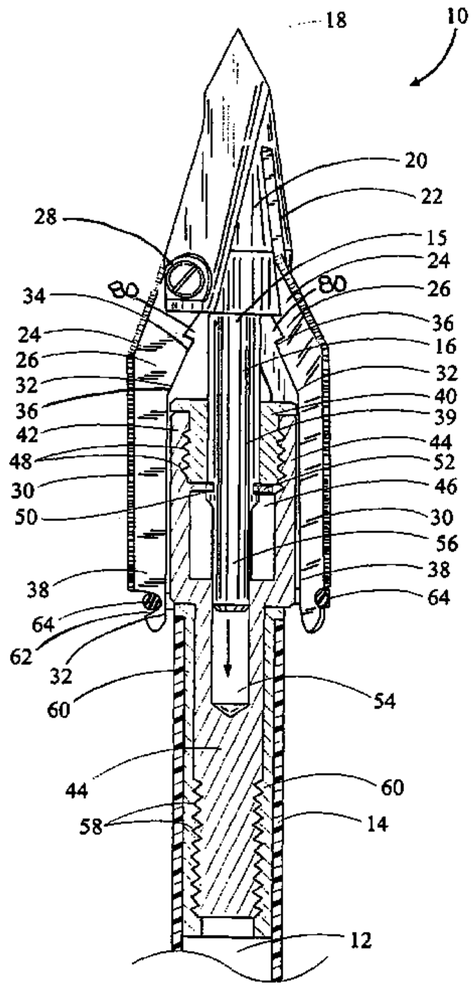
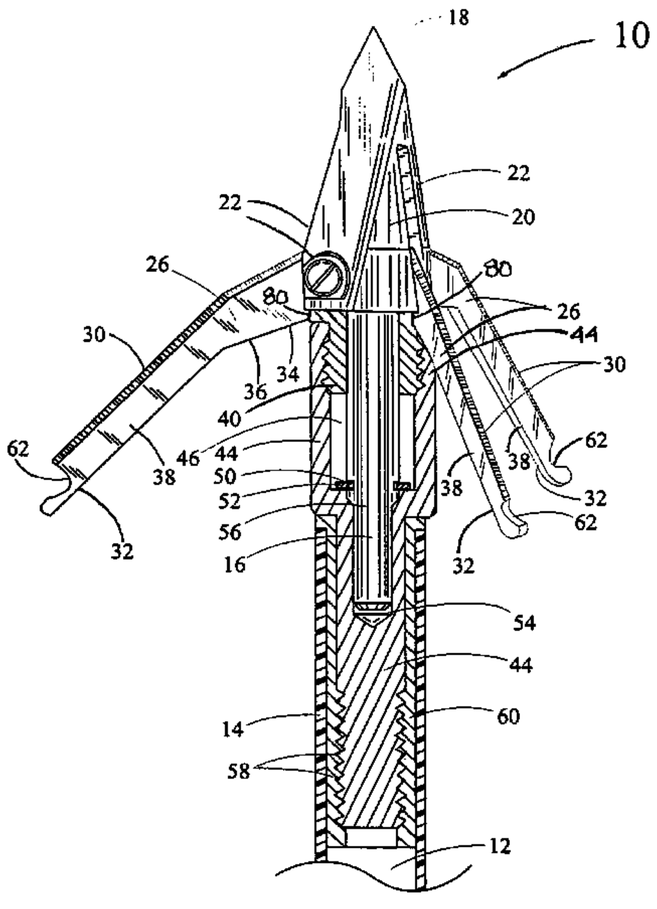
(57) **ABSTRACT**

An expandable arrow broadhead used for releasable attachment to one end of a hollow arrow shaft. The broadhead includes a sliding shaft with a pointed tip and tip base having two or more of cutting blades mounted thereon. Each of the blades includes an outer cutting edge and an inner edge with a beveled cam surface and locking notch therein. A portion of the sliding shaft is slidably received inside a hollow collar. The collar is attached to a sliding shaft housing. The sliding shaft housing is attached to an arrow shaft insert. The arrow shaft insert is adapted for receipt inside one end of the arrow shaft. In a retracted position, the blades are disposed next to and parallel to the length of the sliding shaft. When the pointed tip engages a target, the sliding shaft moves inwardly and rearwardly sliding inside the collar and inside a sliding shaft bore hole in the sliding shaft housing. As the sliding shaft moves rearwardly, the beveled cam surface of the blades engages a portion of the collar, which moves the blades outwardly with locking notch securing the blades in an extended position.

18 Claims, 4 Drawing Sheets





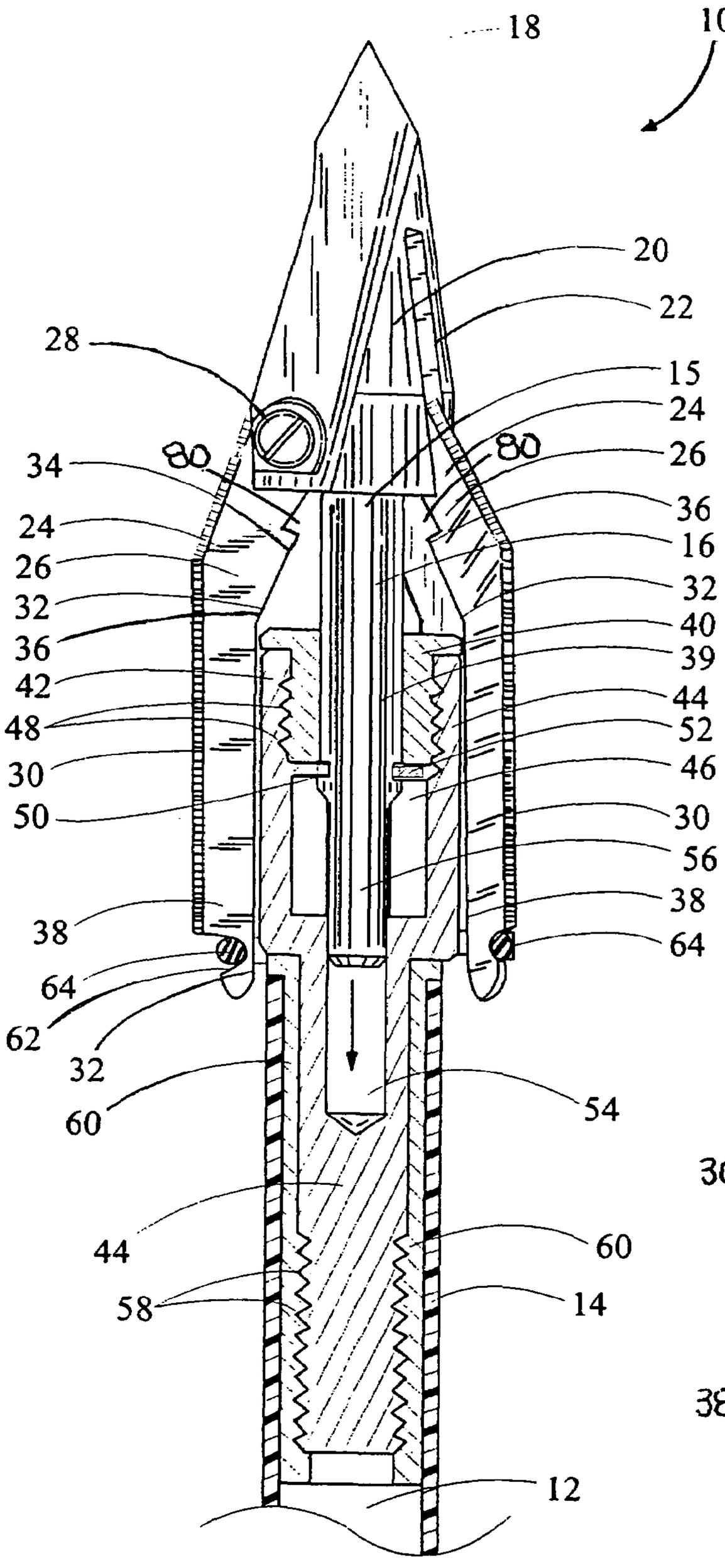

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FIG. 1

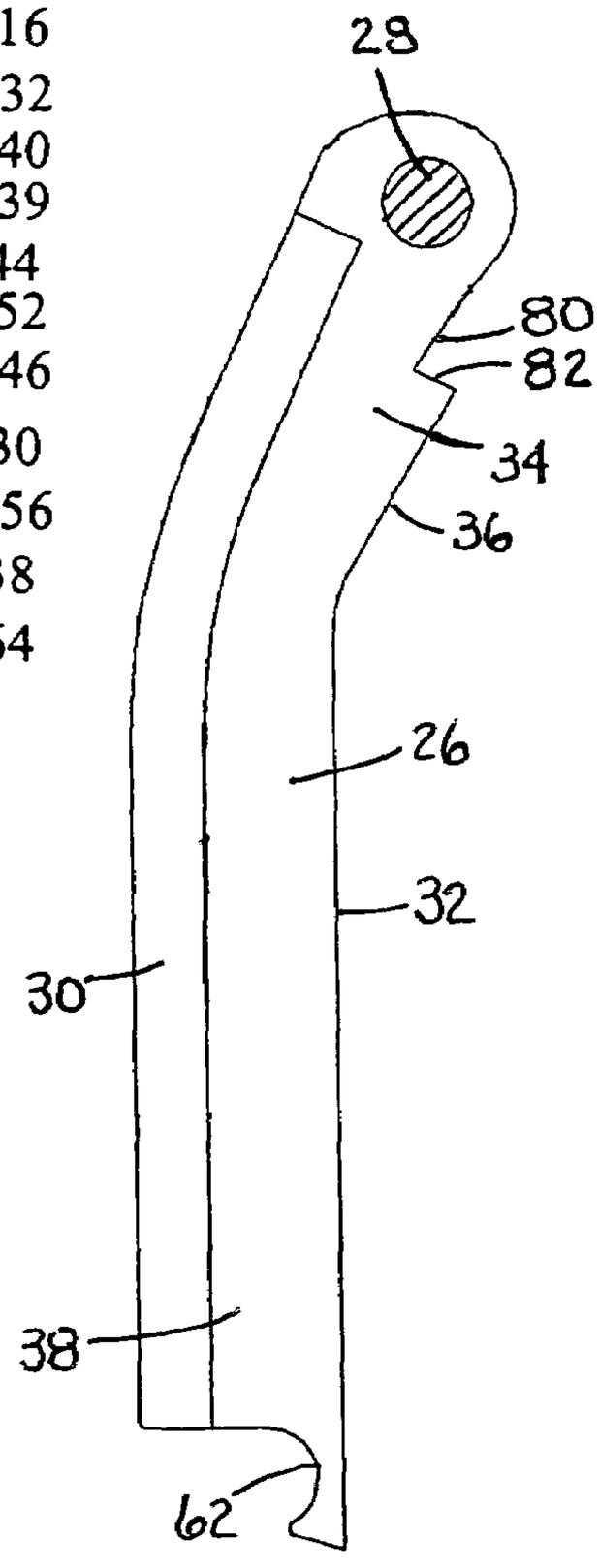
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FIG. 1A

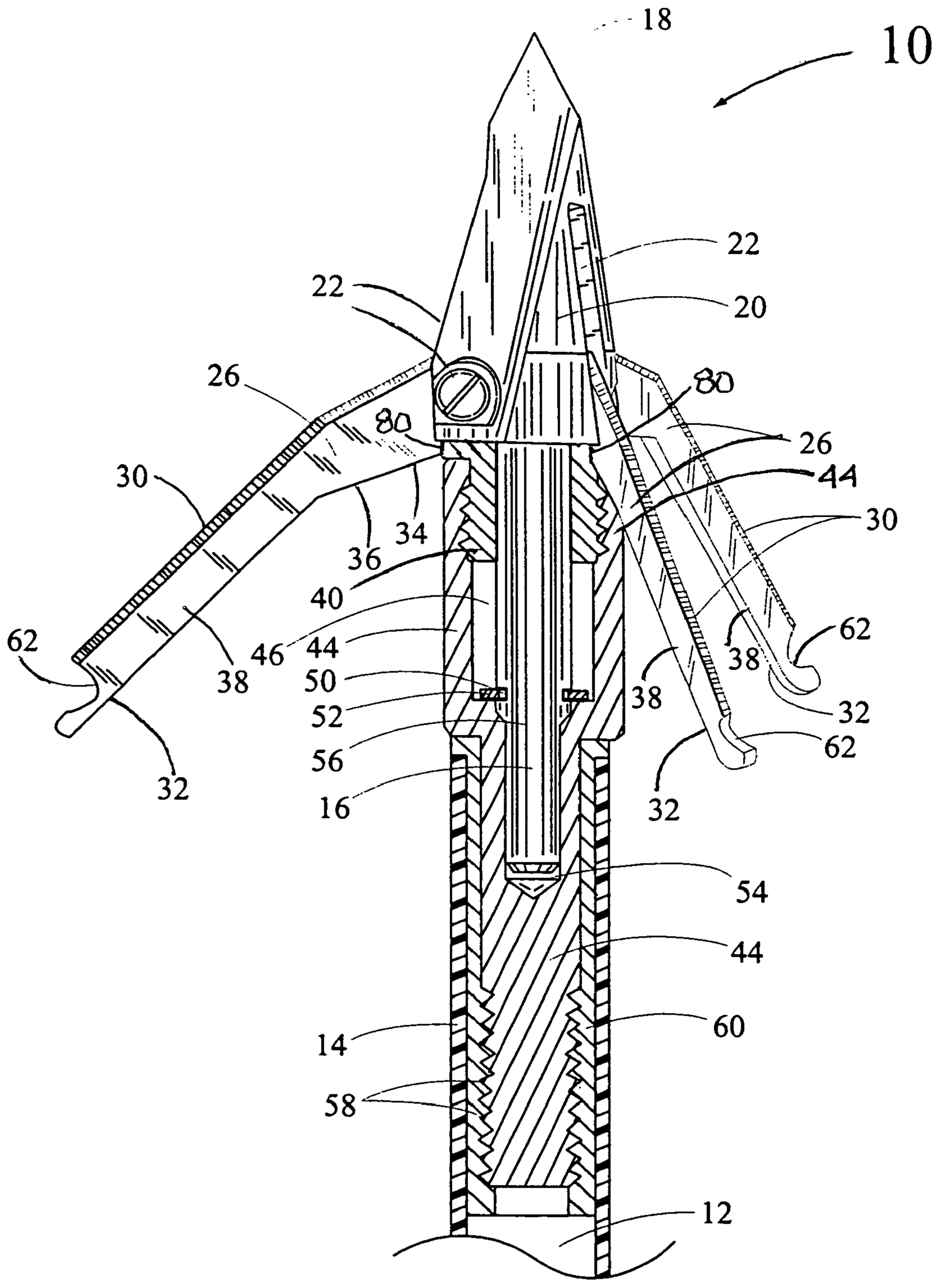
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FIG. 2

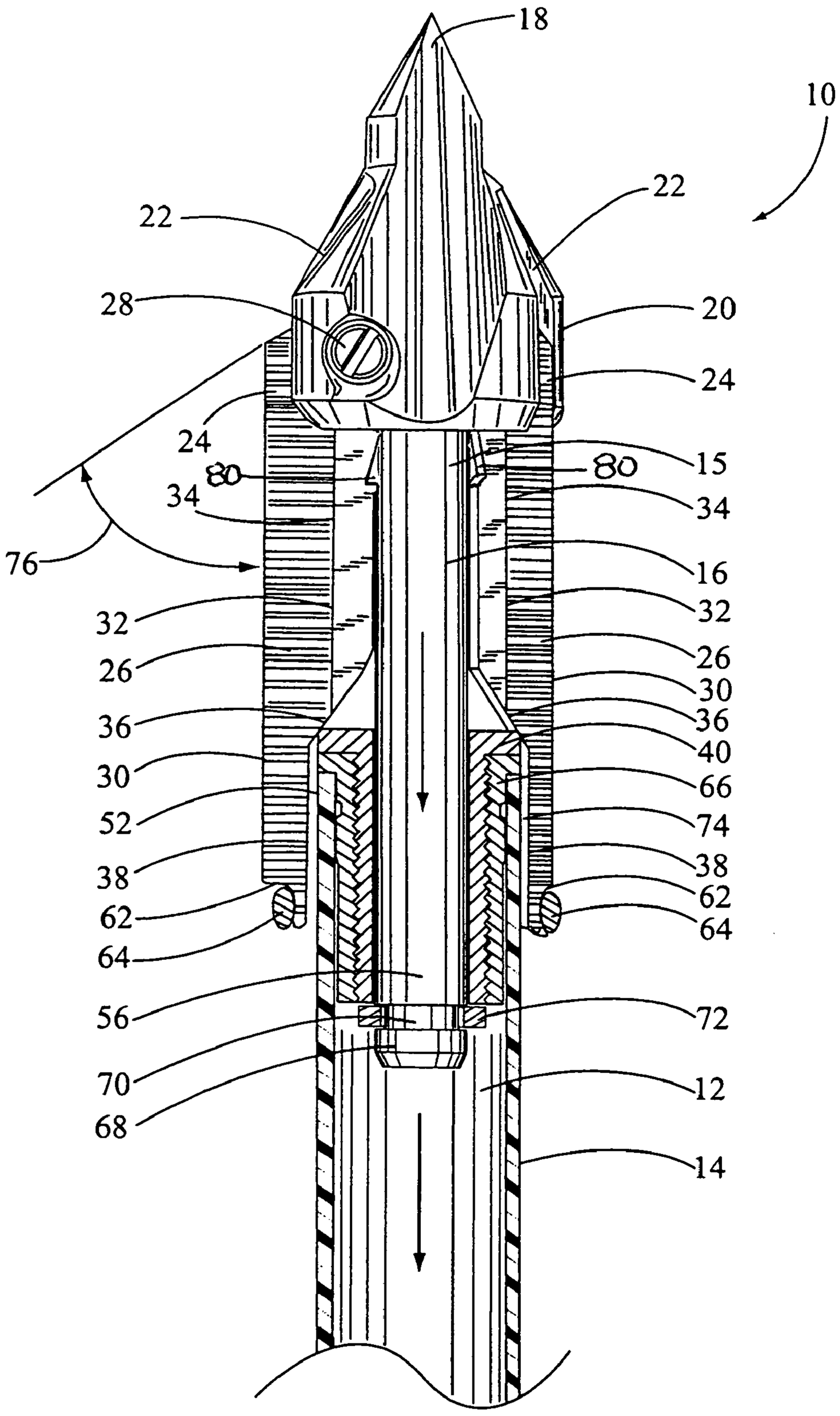
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FIG. 3

FIG. 4

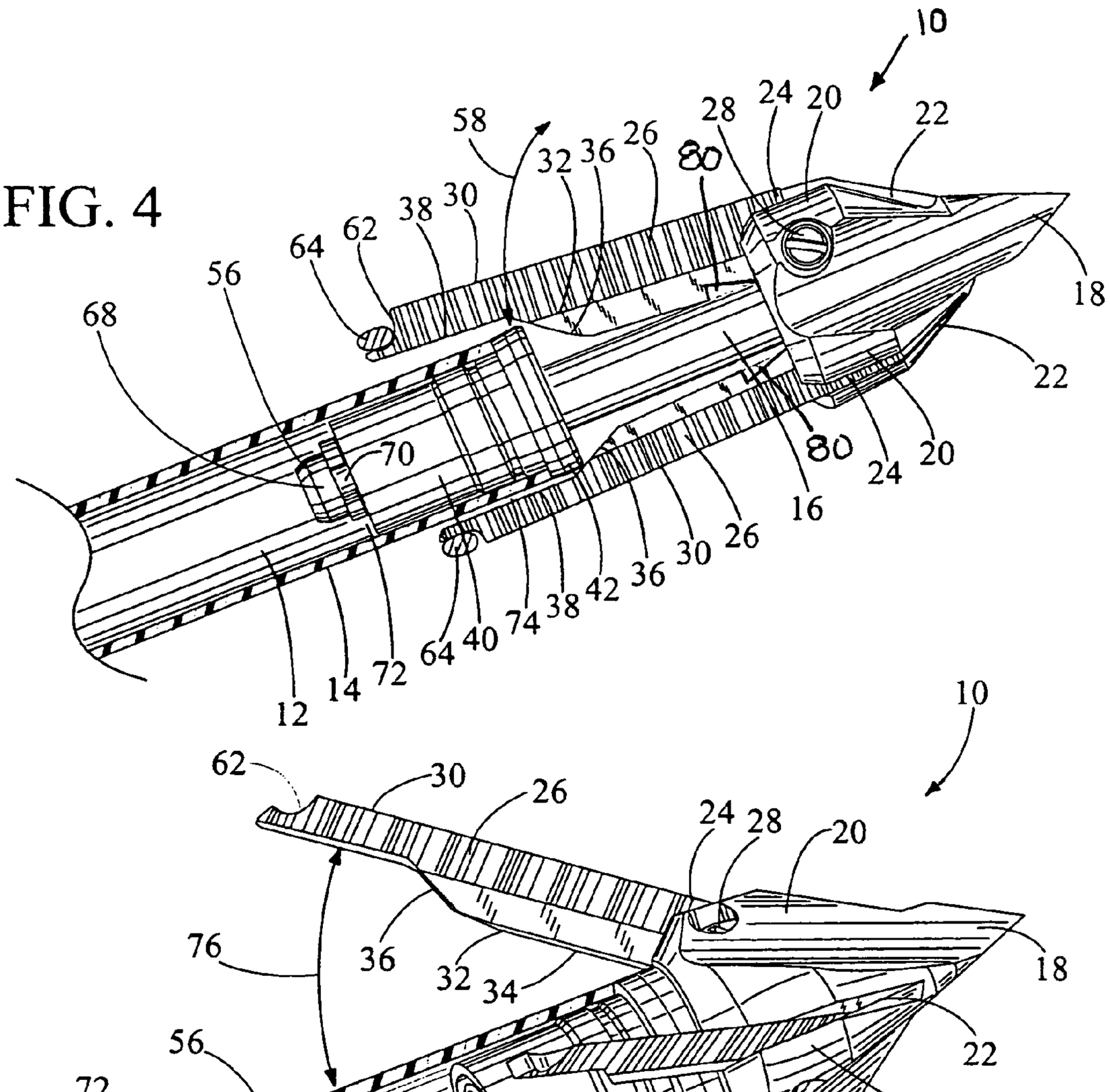
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FIG. 5

EXPANDABLE ARROW BROADHEAD WITH CUTTING BLADE LOCKING NOTCH

This application is a Continuation-In-Part patent application of an application filed on Apr. 24, 2006, Ser. No. 11/410,771 now U.S. Pat. No. 7,226,375, by the subject inventor and having a title of "EXPANDABLE ARROW BROADHEAD FOR ATTACHMENT TO ONE END OF AN ARROW SHAFT.

BACKGROUND OF THE INVENTION

(a) Field of the Invention

This invention relates broadly to an expandable arrow broadhead and more particularly, but not by way of limitation, to an arrow broadhead having a sliding shaft for extending outwardly at least two cutting blades upon impact on a target. The cutting blades include a locking notch formed therein for holding the blades in an open, extended position when contacting the target.

(b) Discussion of Prior Art

Heretofore, there have been a number of arrow broadheads having blades that extend outwardly when contacting a surface of a target. U.S. Pat. No. 6,935,976 to Grace, Jr. et al., discloses a mechanical broadhead having blades, mounted in longitudinal channels in a ferrule, that slide outwardly on a camming surface formed in an inward edge of each blade. U.S. Pat. No. 6,270,435 to Sodaro illustrates an arrowhead having spring loaded blades that expand outwardly upon contact with a target. U.S. Pat. Nos. 6,910,979, 6,626,776 and 6,517,454 to Barrie et al. disclose blades having longitudinal grooves in the blades and a camming member for extending the blades outwardly upon target impact. U.S. Pat. Nos. 6,669,586 and 6,200,237 to Barrie disclose blades mounted on a sliding body mounted on a length of the broadhead. As the sliding body moves rearwardly upon target impact, the blades engage a camming surface and are moved outwardly in an extended and locked position.

None of the above mentioned prior art broadhead patents particularly disclose or teach the structure and function of an arrow broadhead having a sliding shaft with pointed tip and cutting blades attached. The sliding shaft is designed to move rearwardly upon target impact with the blades expanding outwardly upon engaging a threaded collar attached to a sliding shaft housing or attached directly to an arrow shaft insert mounted in one end of a hollow arrow shaft.

SUMMARY OF THE INVENTION

In view of the foregoing, it is a primary objective of the subject invention to provide an arrow broadhead that maintains cutting blades in a retracted folded position and next to a sliding shaft for little or no deflection during arrow flight or at target contact. The blades expand outwardly from the folded position into an extended and locked position upon target contact.

Another object of the arrow broadhead is the expanded blades, held in a locked position, provide for a large cutting diameter to cause increased hemoraging and a quick and more humane kill when hunting deer, elk and other animals. The locked blades insure that the blades are held in place in an extended position for cutting a large opening in the target.

Still another object of the invention is the arrow broadhead can be inserted in a press fit or threaded into an end of different size arrow shaft inserts or mounted on a ferrule attached to the end of the arrow shaft.

Yet another object of the arrow broadhead is a pointed tip is formed at one end of the sliding shaft. Therefore, the moment the pointed tip contacts the target, the sliding shaft moves rearwardly moving the cutting blades into locked and extended position.

The subject arrow broadhead includes a sliding shaft with a pointed tip formed in a front portion of the shaft. The pointed tip is tapered rearwardly and outwardly forming a tip base. The tip base includes grooves formed therein and parallel to a length of the sliding shaft. The grooves are used for receiving a pivot end of two or more of cutting blades. The pivot end of the cutting blades is pinned to sides of the grooves. Each of the blades includes an outer cutting edge and an inner edge. The inner edge of the blades includes a beveled cam surface disposed next to a portion of the length of the sliding shaft. The cam surface includes an inverted "V" shaped locking notch therein. A portion of the sliding shaft is slidably received inside a threaded collar. The collar is attached to a sliding shaft housing or the threaded collar is attached directly to an arrow shaft insert. The arrow shaft insert is adapted for receipt inside one end of a hollow arrow shaft. In a retracted position, the blades are disposed next to and parallel to the length of the sliding shaft. When the pointed tip engages a target upon impact, the sliding shaft moves rearwardly sliding inside the threaded collar. As the sliding shaft moves rearwardly, the beveled cam surface engages a portion of the threaded collar and moves the blades outwardly into an extended position. At this time, the locking notch is received around a portion of the threaded collar for holding the cutting blades in the extended position during the engagement of the target.

These and other objects of the present invention will become apparent to those familiar with the use of arrow broadheads for hunting when reviewing the following detailed description, showing novel construction, combination, and elements as described, and more particularly defined by the claims, it being understood that changes in the embodiments to the disclosed invention are meant to be included as coming within the scope of the claims, except insofar as they may be precluded by the prior art.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate complete preferred embodiments in the present invention according to the best modes presently devised for it's practical application and in which:

FIG. **1** is a side view of a primary embodiment of the subject arrow broadhead illustrating a sliding shaft housing for receiving a portion of a sliding shaft. A threaded lower end of the sliding shaft housing is attached to an arrow shaft insert in a hollow arrow shaft.

FIG. **1**A is a side view of one of the broadhead's cutting blades with an inverted "V" shaped locking notch in the cam surface of the inner edge of the blade. The locking notch is used to engage a portion of a hollow collar and hold the cutting blade in an extended position upon target contact.

FIG. **2** is another side view of the arrow broadhead shown in FIG. **1** with the sliding shaft moved inwardly into a sliding shaft bore hole in the sliding shaft housing. Also shown in this drawing is the beveled cam surface of the cutting blades engaging the side of a hollow collar and moving the cutting blades outwardly into an extended position.

FIG. **3** is a side view of another embodiment of the subject arrow broadhead with a sliding shaft and attached to an arrow

shaft insert in one end of a hollow arrow shaft. The arrow shaft insert and the end of the arrow shaft are shown in cross section.

FIG. **4** is a side view of the arrow broadhead shown in FIG. **3** with the sliding shaft and illustrating cutting blades in a retracted folded position during arrow flight.

FIG. **5** is a perspective view of the arrow broadhead shown in FIG. **4** with the sliding shaft moved rearwardly. The cutting blades are shown pivoted outwardly into an extended position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. **1**, a side view of a primary embodiment of the subject arrow broadhead is shown and having general reference numeral **10**. The arrow broadhead **10** is adapted from mounting to an open end **12** of a hollow arrow shaft **14**. A portion of the arrow shaft **14** is shown in cross section.

The arrow broadhead **10** includes a sliding shaft **16** with a pointed tip **18** formed in a front portion **15** of the shaft **16**. The pointed tip **18** is tapered rearwardly and outwardly forming a tip base **20**. The tip base **20** includes grooves **22** formed therein and parallel to a length of the sliding shaft **16**. The grooves **22** are used for receiving a pivot end **24** of two or more of cutting blades **26** equally spaced around the circumference of the tip base **20**. In this drawing, two of the cutting blades **26** can be seen. In FIG. **5**, three of the cutting blades **26** are shown and equally spaced around the tip base **20**. The pivot end **24** of the cutting blades **26** is attached to the sides of the grooves **22** using pivot pins **28**.

Each of the cutting blades **26** include an outer cutting edge **30** and an inner edge **32**. The inner edge **32** of the blades **26** is disposed next to a portion of a length of the sliding shaft **16**. Also, the inner edge **32** of the blades **26** is characterized by having a forward portion **34** with a beveled cam surface **36** and a rearward portion **38**. The rearward portion **38** is also parallel to the length of the sliding shaft **16**. A middle portion **39** of the sliding shaft **16** is slidably received inside and through a hollow collar **40**. The exterior of the collar **40** is threaded into a top portion **42** of a sliding shaft housing **44**.

The sliding shaft housing **44** includes a collar bore hole **46** with an threaded upper end **48**. The threaded upper end **48** of the collar bore hole **46** is used for threading the hollow collar **40** thereon. In the lower end of the middle portion **39** of the shaft **16** is an annular groove **50** for receiving a ring keeper **52**. The ring keeper **52** prevents the sliding shaft **16** from being removed from inside the threaded hollow collar **40**

The sliding shaft housing **44** also includes a smaller, sliding shaft lower bore hole **54** for receiving a lower end portion **56** of the sliding shaft **16**. A threaded lower end **58** of the sliding shaft housing **44** is used for attachment to a first arrow shaft insert **60** in the hollow arrow shaft **14**. The lower end **58** can also be without threads and attached to the arrow shaft insert **60** in a press fit. Typical, hunting arrows include the arrow shaft insert **60**, therefore, the arrow broadhead **10** can be easily attached to different types of arrows by merely threading the sliding shaft housing **44** into the arrow shaft insert **60** as shown.

The outer cutting edge **30** of the blades **26** includes an outer notch **62** for receiving a portion of a rubber band **64** or like retaining device for holding the blades **26** in a folded, retracted position, as shown in FIGS. **1**, **3** and **4**. Also, the band **64** helps prevent the sliding shaft **16** from sliding rearwardly and inwardly in the collar **40** during the flight of the arrow and prematurely extending the blades **26** outwardly in an extended position as shown in FIGS. **2** and **5**. The band **64** is shown in cross section.

In FIG. **1**A, one of the cutting blades **26** is shown with an inverted "V" shaped locking notch **80** formed in the inner edge **32** of the beveled cam surface **36**. The locking notch **80** is disposed in the forward portion **34** of the blade. The feature of the locking notch **80** is important in that when the cam surface **36** slides against a portion of the hollow collar **40** and when the cutting blade **26** is in an extended position, the locking notch **80** drops into a locked position holding the blades in the extended position. Note, that the locking notch **80** includes an edge **82**, approximately at 90 degrees to the cam surface **36** to insure a drop-in engagement of the cutting blade **26** against the collar **40**.

In FIG. **2**, another side view of the arrow broadhead **10** is shown with the lower end portion **56** of the sliding shaft **16** moved inwardly into the sliding shaft lower bore hole **54**. Also shown in this drawing is the beveled cam surface **36** of the cutting blades **26** engaging the side of the hollow collar **40** and moving the cutting blades outwardly into an extended position.

In FIG. **3**, another embodiment of the invention is shown and without using the sliding shaft housing **44**, as shown in FIGS. **1** and **2**. In this example, the lower end portion **56** of the sliding shaft **16** is slidably received inside and through the hollow collar **40**. The exterior of the hollow collar **40** is either threaded or engaged in a press fit inside a second arrow shaft insert **66**, similar to the first arrow shaft insert **60** shown in FIGS. **1** and **2**.

The hollow collar **40** and the second arrow shaft insert **66** are shown in cross section in this drawing. The arrow shaft insert **66** is adapted for receipt inside the open end **12** of the hollow arrow shaft **14**. The collar **40** and insert **66** can be of various lengths and sizes for attachment to different types and sizes of hollow arrow shafts.

A bottom end **68** of the lower end portion **56** of the shaft **16** includes an annular groove **70** for receiving a portion of a ring keeper **72** therein. The ring keeper **72** is shown in crossection. The ring keeper **72** is used for holding the shaft **16** inside collar **40**.

In a retracted folded position, the blades **26** of the arrow broadhead **10** are disposed next to and parallel to the length of the sliding shaft **16**. It should be noted the rearward portion **38** of the inner edge **32** of the cutting blades **26** includes an inner notch **74** therein. The inner notch **74** allows the rearward portion **38** of the blades to rest next to a side of the hollow collar **40** and a side of the arrow shaft **14**.

In FIG. **4**, a side view of the arrow broadhead **10** is shown during arrow flight. In this drawing, the blades **26** are held in a retracted position by the rubber band **64** for reducing air resistance during flight. Upon impact, the force against the shaft **16** releases the rubber band **64** from the outer notch **62** of the blades **26** as the sliding shaft **16** moves readwardly through the collar **40**.

When the pointed tip **18** engages a target upon impact, the sliding shaft **16** moves rearwardly sliding inside and through the collar **40** and into a portion of the hollow arrow shaft **14**. As the sliding shaft **16** moves rearwardly, the beveled cam surface **36** engages a portion of an exterior side of the hollow collar **40** and moves the blades **26** outwardly into an extended position.

In FIG. **5**, a perspective view of the arrow broadhead **10** is shown with the sliding shaft **16** moved rearwardly upon target contact. The cutting blades **26** are shown pivoted outwardly at an angle, shown as arrow **76**, in a range of 30 to 60 degrees from the length of the sliding shaft **16** and into an extended

position. In this drawing, the lower end portion **56** and the ring keeper **72** of the sliding shaft **16** are shown extending inside a portion of the hollow arrow shaft **14**.

While the invention has been particularly shown, described and illustrated in detail with reference to the preferred embodiments and modifications thereof, it should be understood by those skilled in the art that equivalent changes in form and detail may be made without departing from the true spirit and scope of the invention as claimed except as precluded by the prior art.

The embodiments of the invention for which an exclusive privilege and property right are claimed are defined as follows:

1. An arrow broadhead adapted for attaching to an open end of a hollow arrow shaft, the broadhead adapted for moving from a retracted position to an extended position when contacting a target, the broadhead comprising:

a sliding shaft having a pointed tip, said pointed tip formed in a front portion of said shaft, said pointed tip tapered rearwardly and outwardly forming a tip base;

at least two cutting blades pivotally attached to said tip base, said blades including an outer cutting edge and an inner edge, the inner edge of said blades including a beveled cam surface, also the inner edge of said cutting blades having a locking notch therein;

a hollow collar for receiving a portion of said sliding shaft therethrough; and

a sliding shaft housing having a bore hole therein and a threaded lower end, said hollow collar attached to a side of said bore hole, a lower end portion of said sliding shaft received in said bore hole, said threaded lower end of said sliding shaft housing adapted for receipt inside the open end of the hollow arrow shaft;

whereby, when said pointed tip contacts a target, said sliding shaft moves inwardly through said hollow collar and into said bore hole and the beveled cam surface of said blades contacts a portion of a side of said hollow collar and moves said blades outwardly from a folded, retracted position into an extended position and in an extended position said locking notch received against a portion of said hollow collar for holding said blades in an extend position.

2. The broadhead as described in claim **1** wherein said bore hole of said sliding shaft housing includes a threaded upper end in a collar bore hole and a smaller sliding shaft bore hole below said collar bore hole, said hollow collar attached to the threaded upper end of said sliding shaft housing, a lower end portion of said sliding shaft received in said sliding shaft bore hole.

3. The broadhead as described in claim **1** wherein said bore hole of said sliding shaft housing includes an upper end in a collar bore hole and a smaller sliding shaft bore hole below said collar bore hole, said hollow collar attached to the upper end of said sliding shaft housing in a press fit, a lower end portion of said sliding shaft received in said sliding shaft bore hole.

4. The broadhead as described in claim **1** further including a round hollow arrow shaft insert adapted for receipt in the open end of the arrow shaft, the threaded lower end of said sliding shaft housing attached to said arrow shaft insert.

5. The broadhead as described in claim **1** further including three cutting blades equally spaced around a circumference of said tip base and pinned inside grooves in the side of said tip base.

6. The broadhead as described in claim **1** further including a blade retaining band received in an outer notch in said blades, said band for holding said blades in a folded, refracted position during arrow flight.

7. The broadhead as described in claim **1** wherein a portion of said sliding shaft includes an annular groove therein for receiving a ring keeper, said ring keeper preventing said sliding shaft from being removed from said hollow collar.

8. An arrow broadhead adapted for attaching to an open end of a hollow arrow shaft, the broadhead adapted for moving from a retracted position to an extended position when contacting a target, the broadhead comprising:

a sliding shaft having a pointed tip, said pointed tip formed in a front portion of said shaft, said pointed tip tapered rearwardly and outwardly forming a tip base, said tip base having grooves formed therein and parallel to a length of said sliding shaft;

at least two cutting blades, said grooves in said tip base used for receiving a pivot end of said cutting blades, the pivot end of said cutting blades pinned to sides of said grooves, said blades including an outer cutting edge and an inner edge, the inner edge of said cutting blades including a beveled cam surface, also the inner edge of said cutting blades having a locking notch therein;

a hollow collar for receiving a portion of said sliding shaft therethrough; and

a sliding shaft housing having an interior threaded upper end in a collar bore hole, a sliding shaft lower bore hole below said collar bore hole and an exterior threaded lower end, said hollow collar attached to the threaded upper end of said sliding shaft housing, a lower end portion of said sliding shaft received in said sliding shaft bore hole, the lower end of said sliding shaft housing adapted for receipt inside the open end of the hollow arrow shaft;

whereby, when said pointed tip contacts a target, said sliding shaft moves inwardly through said hollow collar and into said sliding shaft lower bore hole and said beveled cam surface contacts a portion of a side of said hollow collar and moves said blades outwardly from a folded, retracted position into an extended position and said locking notch received against a portion of said hollow collar for holding said cutting blades in an extended position.

9. The broadhead as described in claim **8** further including a round hollow arrow shaft insert adapted for receipt in the open end of the arrow shaft, said exterior threaded lower end of said sliding shaft housing attached to said arrow shaft insert.

10. The broadhead as described in claim **8** further including three cutting blades equally spaced around a circumference of said tip base and pinned inside grooves in the side of said tip base.

11. The broadhead as described in claim **8** further including a blade retaining band received in an outer notch in said three blades, said band for holding said blades in a folded, retracted position during arrow flight.

12. The broadhead as described in claim **8** wherein a portion of said sliding shaft includes an annular groove therein for receiving a ring keeper, said ring keeper preventing said sliding shaft from being removed from said hollow collar.

13. An arrow broadhead adapted for attaching to an open end of a hollow arrow shaft, the broadhead also adapted for moving from a folded, retracted position to an extended position when contacting a target, the broadhead comprising:

a sliding shaft having a pointed tip, said pointed tip formed in a front portion of said shaft, said pointed tip tapered

rearwardly and outwardly forming a tip base; at least two cutting blades pivotally attached to said tip base, said blades including an outer cutting edge and an inner edge, the inner edge of said blades including a beveled cam surface, also the inner edge of said blades includes a forwardly oriented locking notch therein; and

a hollow collar adapted for receipt inside the open end of the hollow arrow shaft, a lower end portion of said sliding shaft slidably received inside said collar,

whereby, when said pointed tip contacts the target, said sliding shaft moves rearwardly through said hollow collar and the beveled cam surface of said blades contacts a portion of a side of said hollow collar, the beveled cam surface moving said blades outwardly from the folded, retracted position next to a length of said shaft into the extended position and said locking notch received against a portion of said hollow collar for holding said cutting blades in an extended position and wherein the engagement of said locking notch with said hollow collar prevents said sliding shaft from moving forwardly with respect to said hollow collar.

14. The broadhead as described in claim **13** further including an arrow shaft insert adapted for receipt in the open end of the arrow shaft, said collar received inside said shaft insert.

15. The broadhead as described in claim **13** further including three cutting blades equally spaced around a circumference of said tip base and pinned thereto.

16. The broadhead as described in claim **13** further including a blade retaining means received on said blades for holding said blades in a folded, retracted position during arrow flight.

17. The broadhead as described in claim **16** wherein said blade retaining means is a rubber band received around a rearward portion of said blades.

18. The broadhead as described in claim **16** wherein a rear portion of said sliding shaft includes an annular groove therein for receiving a ring keeper, said ring keeper preventing said sliding shaft from being removed from said collar.

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